

THE UNIVERSITY OF IOWA



February 13, 1996

Department of the Navy
Office of Naval Research
Mr. Todd A. Frye
Administrative Contracting Officer
Chicago Regional Office
Federal Building Room 208
536 South Clark Street
Chicago, Illinois 60605-1588

Re: Final Technical Report and Patent Report on N00014-91-J-1240; *Neural Systems
Underlying Visual Recognition in Humans*; Antonio R. Damasio, Principal Investigator

Dear Mr. Frye:

As requested, please find enclosed a copy of the final technical report for the above-referenced project. A copy of this report was already submitted to the scientific officer, Terry T. Allard, under earlier cover. It is being forwarded now also to the Director, Naval Research Laboratory and the DTIC as directed by the grant instrument.

The final patent report is also submitted with this letter in accordance with grant article 12. If applicable, any remaining final reports will be submitted under separate cover by our Grant Accounting Office.

Please feel free to call if you have questions or concerns regarding these or related matters.

Thank you for your assistance.

Sincerely,

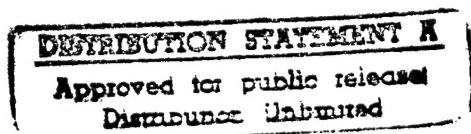
Brenda L. Akins
Assistant Director

Enclosures

c: A. Damasio (cover letter and final patent report only)

Director, Naval Research Laboratory (cover letter and final technical report only)
Attn: Code 2627
Washington, D.C. 20375

✓ Defense Technical Information Center (cover letter and final technical report only)
Building 5, Cameron Station
Alexandria, Virginia 22304-6145



DTIC QUALITY INSPECTED 1



DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
SEATTLE REGIONAL OFFICE
1107 NE 45TH STREET, SUITE 350
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IN REPLY REFER TO:

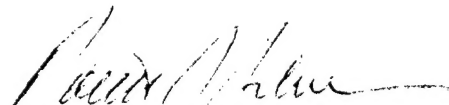
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11 Jul 97

From: Director, Office of Naval Research, Seattle Regional Office, 1107 NE 45th St., Suite 350, Seattle, WA 98105
To: Defense Technical Center, Attn: P. Mawby, 8725 John J. Kingman Rd., Suite 0944, Ft. Belvoir, VA 22060-6218

Subj: RETURNED GRANTEE/CONTRACTOR TECHNICAL REPORTS

1. This confirms our conversations of 27 Feb 97 and 11 Jul 97. Enclosed are a number of technical reports which were returned to our agency for lack of clear distribution availability statement. This confirms that all reports are unclassified and are "APPROVED FOR PUBLIC RELEASE" with no restrictions.

2. Please contact me if you require additional information. My e-mail is *silverr@onr.navy.mil* and my phone is (206) 625-3196.


ROBERT J. SILVERMAN

Progress Report

on

Office of Naval Research Grant #N00014-91-J-1240

Period: September 30, 1994 - October 1, 1995

Principal Investigator

Antonio R. Damasio

University of Iowa College of Medicine
Department of Neurology
Division of Cognitive Neuroscience

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MAIN ACCOMPLISHMENTS

1. We continue to uncover evidence for partially separate neural systems dedicated to knowledge retrieval for nonunique and unique concrete entities.
2. We have made a preliminary demonstration that the neural systems used for retrieval of conceptual knowledge are separate from those used for retrieval of words.
3. We have found preliminary evidence for the role of certain factors inherent in the stimuli (e.g., homomorphism), in the process of learning and retrieval of knowledge regarding concrete entities.

SUMMARY OF WORK

Recent findings from our laboratory indicate that brain-damaged patients can manifest category-specific defects in the retrieval of conceptual knowledge for concrete entities. For example, patients may lose the ability to recognize many animals, but remain entirely normal in their ability to recognize tools; or the reverse may occur. These findings raise interesting questions about the mechanisms of knowledge retrieval defects. It has been suggested, for example, that category-related recognition defects are attributable to the origin of the entities, in terms of whether they are natural (animate, living) or artifactual (manufactured, inanimate, nonliving) (e.g., Warrington & Shallice, 1984). This account has been challenged by those who have seen these defects as a reflection of factors such as familiarity, frequency, and prototypicality (e.g., Farah et al., 1991; Funnell & Sheridan, 1992; Stewart et al., 1992); or as a reflection of the

underlying "difficulty" that makes some entities inherently harder to recognize (e.g., Capitani et al., 1994).

Our view has been, however, that the structural characteristics of the entities provide the best account for their differential compromise in the cited observations (Damasio et al., 1982; Damasio, Damasio, & Tranel, 1990; Damasio, Damasio, Tranel, & Brandt, 1990; Damasio, Tranel, & Damasio, 1993). This view has been supported by others (Gaffan & Heywood, 1993; Humphreys et al., 1988; Riddoch & Humphreys, 1987; Vitkovitch et al., 1993; Small et al., 1995).

We first referred to entities that shared considerable structural characteristics with the term "visual ambiguity," but we now refer to this trait with the term "homomorphism," with which we denote high degrees of shared shape among stimuli. The main thrust of the work performed with ONR support has been to analyze the physical characteristics of the stimuli that are used in the visual recognition experiments.

Method and Procedure

To operationalize the factor of *homomorphism*, we analyzed visual stimuli relative to two measures: degree of *curvilinearity/rectilinearity* and *shape overlap*. As an initial step for both analyses, the slides containing the entities were digitized, and the outer contours of each stimulus were traced, using a computer program especially developed for this purpose.

Curvilinearity/rectilinearity analysis. The percentages of the lengths of the contour classified as rectilinear and curvilinear were calculated and recorded.

Shape overlap analysis. Stimuli were analyzed according to conceptual category. For each category, areas were added into a grand sum image at their optimal overlap with the other images in the category.

Results

Natural entities were significantly more curvilinear than artifactual entities (Table 1). This finding is consistent with our previous interpretations (Damasio, 1990; Damasio, Damasio, & Van Hoesen, 1982; Damasio et al., 1990; Damasio, Tranel, & Damasio, 1993).

TABLE 1: MEASURES OF STIMULUS PROPERTIES

Means (standard deviations)

	Natural	Artifactual	t	p
% Curvilinearity	85.74 (8.05)	66.80 (14.12)	14.43	_.0001

One-way ANOVAs indicated a highly significant effect of Category on both measures--curvilinearity ($F(4,295)=66.76$, $p_{.0001}$) and shape overlap ($F(4,295)=18.64$, $p_{.0001}$). Category means and standard deviations are depicted in Table 2. The Table also shows the grand mean for the shape overlap variable.

TABLE 2: MEASURES OF STIMULUS PROPERTIES

Means (standard deviations)

CATEGORY	% Curvilinear	% Shape Overlap
Animals	85.25 (5.66)	62.99 (7.50)
Fruits/vegetables	86.40 (10.45)	73.25 (10.54)
Tools/utensils	63.58 (13.80)	58.97 (14.01)
Vehicles	73.77 (12.08)	68.73 (11.12)
Musical instruments	77.76 (9.54)	60.12 (8.78)

Publications

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